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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Sosin	Examiner:	Blau
Serial No.:	09/248,515	Art Unit:	3711
Filing Date:	February 8, 1999		
Title:	GOLF CLUB AND METHOD OF DESIGN		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY BRIEF UNDER 37 C.F.R. § 1.193

The Examiner has raised various new points of argument in the Answer that was mailed August 24, 2004 and Appellant offers the present comments in Response. For ease of presentation, the comments are organized according to cited prior art references. Appellant also addresses the Examiner's new arguments regarding the Declarations and the Examiner's reliance on *In re Seid*, 161 F.2d 229 (CAFC 1947). For the convenience of the Board, references to the Examiner's numbered items 23 to 43 (presented between pages 13 and 24 of the Answer) are also included. If a given item is not specifically discussed herein, then the Examiner has not presented new points of argument and/or Appellant relies on the arguments made in the Appeal Brief.

At several points in this Reply Brief Appellant makes reference to certain Exhibits that are being filed as separate papers herewith (a Request that these Exhibits be entered under 37 C.F.R. § 1.195 is also filed herewith). It is to be understood that Exhibits A, B and D are provided by Appellant for the convenience of the Examiner and Board as evidence of certain standards in golf design that are well known in the art. Exhibit C simply provides a convenient illustration of certain advantages of Appellant's invention as further described and illustrated in the application as filed. For these reasons, the Board will appreciate that the arguments that are presented in this Reply Brief are not conditional upon entrance of these Exhibits.

Thompson

(23) Under item 23, the Examiner discusses Thompson and refers again to the Figures claiming that Figure 2 shows a lean angle. Specifically, the Examiner states: "Thompson clearly shows the resting surface (Ref. No. 34, Fig. 2) and the club designed to lay flat on the resting surface (Col. 3, Lns. 17-18) and the hosel and shaft being at an angle to the vertical plane. In figure 4 of Thompson, Thompson was able to show the loft to which appears to a vertical which is different from the orientation seen in figure 2."

Appellant does not completely understand the last sentence of this statement. However, it would appear that the logic of the Examiner's argument goes as follows: (1) the angle α shown in Fig. 4 is the design loft; (2) the clubs in Figs. 2, 3 and 4 were designed to rest on a horizontal surface 34 as depicted; and therefore (3) Fig. 2 depicts a golf club resting at its design loft on a horizontal surface with the hosel and shaft at a non-zero lean angle. Appellant respectfully submits that the explicit teachings of Thompson contradict the Examiner's interpretation.

First, Appellant notes that the cited text at Col. 3, Lns. 17-18 simply teaches that Fig. 3 depicts a frontal view of a club "with the keel resting flatly on the horizontal surface 34." There is *no* teaching that Fig. 3 shows how the depicted clubs were *designed* to rest as the Examiner suggests. All we are taught is that *if* we place the keel flatly on a horizontal surface then Fig. 3 depicts what a frontal view of the club will look like.

Second, at Col. 2, Lns. 14-16, Thompson explicitly teaches that Fig. 4 is intended to represent "an iron known as a *wedge* for which α is between about 30 and 40 degrees from vertical" (*emphasis* added). The depicted angle α is about 35 degrees. The Examiner wants us to believe that this angle α corresponds to the *design loft* of the depicted wedge. However, it is a well known fact that the design lofts of wedges range from about 45 to 64 degrees and not 30 to 40 degrees (e.g., see Exhibit A taken from Cleveland® Golf's "Wedge Selection Guide"). The design loft range of 30 to 40 degrees corresponds to the 6, 7 and 8 irons (e.g., see Exhibit B that shows the design lofts of a collection of different iron sets made by Cleveland® Golf). The obvious and logical conclusion from these facts is that Fig. 4 does *not* show a wedge resting on a horizontal surface at its design loft. Instead, it must be that the wedge is shown tipped forward so that its keel rests flatly on the horizontal surface.

Third, to further support the logic of this conclusion, Appellant respectfully reminds the Examiner that wedges (and irons in general) are designed with a certain degree of "bounce" (see Exhibit A). The "bounce angle" provides a measure of how much the leading edge of the club head is raised above the ground when the club rests at its design loft. If Figs. 2 and 4 depict a wedge resting on a horizontal surface at its design loft then they depict a wedge that has a bounce angle of 0 degrees. Based on industry standards this is highly unlikely (see Exhibit A). Instead, it is far more likely that the wedge of Figs. 2 and 4 has a certain degree of bounce and that the wedge is shown tipped forward so that its keel rests flatly on the horizontal surface. This "de-lofting" of the wedge would create the impression of a lean angle that is equal to the bounce angle of the wedge. It would also explain why Thompson explicitly teaches that the angle α is between about 30 and 40 degrees when the industry standard wedge design lofts range from 45 to 64 degrees.

For all of these reasons Appellant respectfully submits that the Examiner has incorrectly interpreted Thompson and that Fig. 2 does *not* depict a lean angle.

Adams

(23, 37) Under items 23 and 37, the Examiner refers to Adams that teaches multisole clubs with *multiple* design lofts. Claims 51, 53-54 and 59-69 were first rejected over Adams in an Office Action that was mailed May 22, 2003. In the Response that was filed August 8, 2003, Appellant amended claims 51, 53-54 and 59-60 by specifying that the claimed clubs have a *single* design loft. Appellant inadvertently forgot to make the same amendment to claims 61-69 (note that Appellant's arguments in the same Response clearly assume that all the rejected claims have been similarly amended). In the subsequent and Final Office Action (mailed November 14, 2003), the Examiner maintained the rejection of claims 61-69 over Adams but *removed* the rejection for now amended claims 51, 53-54 and 59-60. Appellant did not notice that claims 61-69 lacked the *single* design loft limitation until the Appeal Brief was prepared. Since the Examiner removed the Adams rejection for amended claims 51, 53-54 and 59-60, Appellant logically assumed that correction of this inadvertent mistake would similarly remove the Adams rejection for claims 61-69. Appellant therefore filed a Supplemental Amendment with the Appeal Brief that simply added the single design loft limitation to claims 61-69. It was Appellant's understanding that this amendment would remove issues from appeal and would

therefore be entered (see MPEP § 1207). However, as noted in the Advisory Action mailed August 12, 2004 the Examiner has refused to enter these minor amendments. Despite Appellant calling the Examiner to explain the purpose of these amendments and to point out that they add no new matter, the Examiner reiterated his refusal in the Answer (see pages 2-3 of Answer). Appellant respectfully requests that the Board give due consideration to the amendments that have been presented by Appellant when considering the rejections over Adams (i.e., Issues 4 and 5).

Ahn

(23) Under item 23, the Examiner discusses Ahn and refers again to the Figures claiming that Figures 2, 5, 9 and 12 show a lean angle. Specifically, the Examiner states: "Ahn shows a flat sole surface with a shaft oriented from a vertical plane". Appellant respectfully disagrees. Ahn does not show any vertical plane, let alone any shaft oriented relative to it. The Figures in Ahn show a golf club head and a short portion of shaft with no external references. The fact that Ahn shows a flat sole is irrelevant. There is no indication in Ahn that the depicted golf club head is intended to be resting on a horizontal surface at its design loft. There is not even any indication of a horizontal surface, or discussion of intended design loft (or bounce). Ahn does not depict a lean angle. For the Examiner's argument to carry any weight, it would at least need to be clear from the drawings and/or the specification of Ahn that the depicted golf club is intended to be shown resting on a horizontal surface at its design loft. As noted by the Examiner and as discussed in greater detail below, accidental disclosures are available as prior art references only if they are *clearly made* in a drawing. *In re Seid*, 161 F.2d 229 (CAFC 1947). Appellant respectfully submits that even if Ahn did in fact accidentally draw a golf club that could be interpreted to have a lean angle, it simply cannot be said that this lean angle was *clearly* shown. Thus, even under *Seid*, the Figures of Ahn cannot be used as prior art.

(32) Under item 32, the Examiner states that "though the ground is not indicated one can easily see that the shaft is not perpendicular to the sole of the head". Whether the piece of shaft shown in any given Ahn picture is perpendicular to the sole shown in that picture is irrelevant to the analysis of whether Ahn clearly shows a lean angle. The proper questions are 1) whether the Figures depict a golf club resting on a horizontal surface at its design loft; and 2) if so, whether

the Figures clearly show one of ordinary skill in the art that such a club has a lean angle. The arguments and Declaratory evidence submitted in this case evidence that they do not.

D'Amico

(39-43) Under items 39-43, the Examiner discusses D'Amico and refers again to the Figures. None of the pending claims have been rejected over D'Amico. Nonetheless, the reference has been extensively discussed, and Appellant addresses the remarks made in the Examiner's Answer here.

As is the case with the Ahn reference, and indeed all of the references cited by the Examiner as teaching a lean angle, the explicit teachings of D'Amico have nothing at all to do with structure or design of golf club head/shaft junctions. D'Amico teaches an alignment device that is placed within the shaft of a standard golf club. The device is supposed to act as a visual aid in helping golfers achieve a repeatable and desirable stance. The Examiner focuses on the fact that D'Amico teaches the placement of a golfer's hands ahead of the ball at impact. Appellant does not dispute that this is standard practice among golfers. In fact, the present invention is specifically designed to address some of the problems that are associated with this practice as follows.

All golf club manufacturers produce golf club heads with specific design lofts. In principle, the design loft is the angle at which the face of the club head should strike the ball. Other design features of the club head including the shape of the sole are based on this principle. Prior to this invention, manufacturers have produced golf clubs by connecting club heads with shafts in such a way that the club face achieves the design loft when the shaft is held in a *vertical* position (see Figure 1 of Exhibit C). Accordingly, golfers could only take full advantage of the design features (e.g., loft, bounce, etc.) of traditional clubs by striking the ball with a vertical shaft. In reality, most golfers have a tendency to "de-loft" the club by striking the ball with a shaft that is either past or short of vertical (see Figure 2 of Exhibit C). As a consequence, the "effective loft" that the ball sees when struck by the club rarely equals the design loft that was intended by the manufacturer (see Figure 2 of Exhibit C). The present inventor has recognized this problem and invented a solution. Specifically, the present invention utilizes a "lean angle" in the design of golf clubs to allow golfers to customize the relationship between design and effective loft for one or more clubs in their bag (see Figure 3 of Exhibit C). In contrast to

traditional golf clubs, the clubs of the present invention are produced by connecting club heads with shafts in such a way that the club face achieves the intended design loft when the shaft is held in a *non-vertical* position (e.g., 5 degrees past vertical). The invention thereby provides golf clubs that can be customized to a particular golfer's swing characteristics (e.g., a tendency to strike the ball with a shaft that is angled 5 degrees past vertical). As a result, golfers that use these clubs are able to take fuller advantage of the design features of golf club heads. In particular, at impact the golfer will be able to take full advantage of the design bounce of the golf club head (see Figure 3 of Exhibit C). D'Amico does not teach or suggest this claimed invention; D'Amico does nothing more than show a standard club that has been "de-lofted" by its user.

Declarations

(24, 26, 28) Under items 24, 26 and 28, the Examiner discusses his reasons for dismissing the Hampford and Loesch Declarations. The Examiner purports to argue that the teachings of the cited art outweigh the probative value of the Declarations. In response, Appellant respectfully points out that there is *no* explicit teaching in any of the cited art of the concept of a lean angle. Thus, the only possible "teaching" of a lean angle comes from interpretation of Figures found in prior art references that each teach unrelated golfing inventions (e.g., Thompson that teaches a golf club with a keel, Ahn that teaches a golf club with an adjustable center of gravity, etc.).

The Examiner offers his own personal opinion that the Figures show a lean angle. On the other hand, Appellant has provided explicit sworn statements from two golfing professionals that a person of ordinary skill in the art would not understand these Figures to show, let alone to *clearly show*, a lean angle. Mr. Hampford has sworn that the present application "describes a golf club fundamentally different from any club that has previously been designed or made" (Hampford Declaration, ¶ 5). Mr. Loesch has sworn that he has "never seen an iron or wedge with a non-zero lean angle" and that "prior to [his] conversations with Mr. Sosin, [he] had never heard of nor considered a wedge with a non-zero lean angle" (Loesch Declaration, ¶ 4).

The Examiner has dismissed these Declarations in favor of his own personal opinion. This is inappropriate. The Declarations are the sworn statements of individuals of at least ordinary skill in the art, who have reviewed the cited art for its teachings and swear that the Examiner is incorrect in his interpretation. The Examiner is not entitled to ignore this and to

substitute his personal view. The Examiner justifies his dismissal on the grounds that the Declarations are inconsistent with the prior art. However, the Declarations are not inconsistent with the prior art, they are only inconsistent with *the Examiner's interpretation* of the prior art. In this battle of opinions, sworn Declarations from persons of at least ordinary skill in the art must outweigh the Examiner's personal view.

(28) Under item 28, the Examiner argues "In the [Loesch] declaration it also states that it would be expected that a picture intended to illustrate a lean angle would discuss it extensively since this concept is so unusual. This statement is not persuasive since other patents have a lean angle do not discuss it extensively either. See item 23 above." Appellant respectfully points out that this argument, i.e., that "it is not meaningful that other patents do not discuss lean angle because other patents do not discuss lean angle" is entirely circular and therefore without merit.

(23) Under item 23 (referred to above in item 28), the Examiner states "If lean angle is so radical than (sic) why did not Adams, D'Amico or Knox discuss it in their written disclosures? *It is because this concept is shown with the drawings and it is not so radical that it needs to be discussed*" (*emphasis* added). In response, Appellant notes that the concept of lean angle is *not* shown in the drawings as the Examiner suggests. In fact, each reference that has been cited by the Examiner *explicitly* states that the drawings are designed to show some aspect of the invention that is being described and claimed by that reference (e.g., the multi-sole club heads of Adams, the use of an alignment device in D'Amico, the location of the center of gravity of the club head in Knox, etc.). None of these references or drawings teach a lean angle.

Appellant further submits that the last statement is truly amazing. Indeed, if the concept of lean angle is so well known (i.e., not radical) then presumably it must be *explicitly* discussed somewhere! Golf design is replete with angles and other measurements (e.g., loft, lie, bounce, offset, club head weight, shaft length, weight, and flex to name a few). If lean angle is so well known in the art of club design then how does the Examiner explain that it is *not* discussed in the prior art and *never* listed among the multitude of golf club parameters that are used in golf club manufacture? Similarly, how does the Examiner explain that neither one of the Declarants had ever heard of it prior to this invention? The reason is simple – because the manufacture of golf clubs with lean angles is novel.

In re Seid

(27, 28, 32, 44) Under items 27, 28, 32 and 44, the Examiner relies on *In re Seid*, 161 F.2d 229 (CAFC 1947). Specifically, the Examiner relies on *Seid* for the proposition that "an accidental disclosure if clearly made in a drawing, is available as a reference". Appellant acknowledges that an accidental disclosure can be relied upon as prior art; however, as stated in *Seid*, only accidental disclosures that are *clearly made* are available.

In *Seid*, the accidental disclosure involved a drawing of a cardboard figure representing the upper half of a human body. *Id.* at 231. The patent applicant did not argue, and the court did not find, that the drawing was ambiguous. *Id.* Instead, the patent applicant argued that despite the unambiguous disclosure it should not be used as prior art because the text did not specifically describe or claim the human figure. The court disagreed and held that as long as the disclosure in the drawing was clear, it was available irrespective of whether the prior art specifically described it or even referred to it. *Id.*

Here, Appellant is arguing that the "disclosures" in the figures of Thompson, Ahn, etc. *are* ambiguous and for that reason should not be used as prior art. In particular, it is Appellant's position that because the cited references are silent on various key teachings (e.g., design lofts and bounce angles) a skilled person simply cannot tell whether the figures do or do not teach a lean angle. This argument is entirely consistent with the holding and supported by the facts of *Seid*. Finally, Appellant also notes that the CAFC has held, in this very context, that when there is any doubt as to whether a particular teaching is or is not clear Appellant is entitled to have it resolved in his favor. *In re Kamrath*, 67 F.2d 928 at 930 (CAFC 1933). Thus to the extent that the Board finds that there is some doubt in the present case it should be resolved in Appellant's favor.

Conclusion

For all of these reasons, Appellant respectfully submits that the pending claims are novel and nonobvious over the cited art, and that the Examiner's rejections should be reversed. Appellant has invented a novel golf club, that allows golfers to take full advantage of the manufactured features of golf club heads despite their own swing characteristics that would ordinarily negate these features. Appellant notes that even today, almost six years after the

present application was filed, golfers continue to struggle to capture the intended loft of their club heads. As evidenced by the most recent issue of Golf Digest (see Exhibit D), golfers continue to bend their clubs in order to improve loft, without even realizing (until advised by a professional) that this strategy deprives them of other features of the golf club head. Neither golfers nor their advisors, even today, consider manufacturing golf clubs with a lean angle. This strategy has important advantages over other solutions available in the art, and is utterly new. The present claims should be allowed.

Respectfully submitted,

10/25/04

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Charles Lyon
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Sir:

REQUEST TO ENTER EXHIBITS SUBMITTED UNDER 37 C.F.R. § 1.195

Appellant hereby requests that Exhibits A-D submitted herewith be entered for purposes of the appeal in the above-referenced application. Exhibits A-D are being submitted to support new arguments in Appellant's Reply Brief that are being made in response to arguments that were first presented in the Examiner's Answer to Appellant's Appeal Brief. Exhibits A-D were not presented earlier for the simple reason that Appellant did not need to respond to the Examiner's new arguments until the Examiner's Answer was received. Please charge any additional fees (or credit any overpayment) to our Deposit Account No. 03-1721.

Respectfully submitted,

10/25/04
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WEDGE SELECTION GUIDE

HOW MANY WEDGES SHOULD YOU CARRY?

Most professionals and serious amateurs carry three or four wedges. It is important to have consistent incremental distances between each wedge in your chosen system.

WEDGE	LOFT RANGE	BOUNCE RANGE
Pitching Wedge	45-49	2-8
Dual Wedge	49-54	5-12
Sand Wedge	54-57	10-16
Lob Wedge	57-64	0-10

Examples of yardage increments for different player profiles.

- Tour Professional
- Average Swing Speed
- Slower Swing Speed

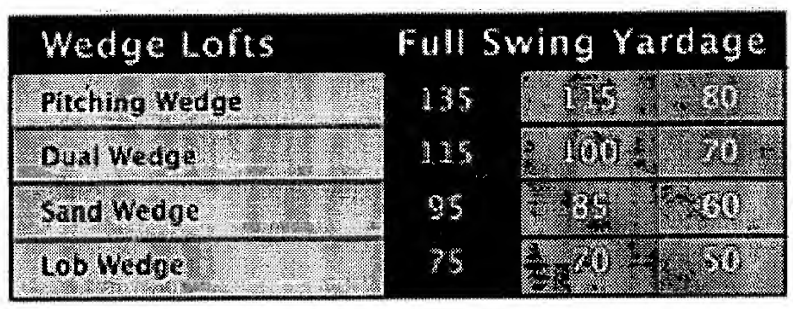

Exhibit A

http://www.clevelandgolf.com/images/wedgeselection/loft02.gif 10/25/04

EQUIPMENT

Cleveland Specifications Archive

1999 Tour Action TA3 specs

Iron	Loft	Lie	Length
1	17	57	39.75
2	19	57	39.25
3	22	58	38.75
4	25	29	38.25
5	28	60	37.75
6	32	61	37.25
7	36	62	36.75
8	40	63	36.25
9	44	64	35.75
PW	48	64	35.5
SW	55	64	35

SHAFT: TRUE TEMPER DYNAMIC STEEL SHAFT
GRIP: GOLF PRIDE

Byron Nelson Irons

Iron	Loft	Lie	Length
1	17	56	39.5
2	20	56	39
3	23	57	38.5
4	26	58	38
5	29	59	37.5
6	33	60	37
7	37	61	36.5
8	41	62	36
9	45	63	35.5

Exhibit B

PW	49	64	35.25
SW	56	64	35

SHAFT: TRUE TEMPER DYNAMIC GOLD STEEL SHAFT
GRIP: GOLF PRIDE

Tour Action 588T specs

Iron	Loft	Lie	Length
1	17	56	39.5
2	20	56	39
3	23	57	38.5
4	26	58	38
5	29	59	37.5
6	33	60	37
7	37	61	36.5
8	41	62	36
9	45	63	35.5
PW	49	64	35.25
SW	56	64	35

SHAFT: TRUE TEMPER DYNAMIC GOLD STEEL SHAFT
GRIP: GOLF PRIDE

Tour Action 588P Specs

Iron	Loft	Lie	Length
1	17	57	39.5
2	19	57	39
3	22	58	38.5
4	25	59	38
5	28	60	37.5
6	32	61	37
7	36	62	36.5
8	40	63	36
9	45	64	35.5
PW	49	64	35.25

SHAFT:TRUE TEMPER DYNAMIC GOLD STEEL SHAFT

GRIP:GOLF PRIDE

Tour Action TA4 Specs

Iron	Loft	Lie	Length
1	16	58.5	39.75
2	18	59	39.25
3	21	59.75	38.75
4	24	60	38.25
5	27	60.5	37.75
6	30.5	61	37.25
7	34	61.5	36.75
8	38	62	36.25
9	42	62.5	35.75
PW	46	62.75	35.5
DW	51	63	35.25
SW	55	63	35

SHAFT:TRUE TEMPER DYNALITE STEEL SHAFT

GRIP: GOLF PRIDE

VAS+ Specs

Iron	Loft	Lie	Length
1	15.5	58.5	39.75
2	18	59	39.25
3	21	59.5	38.75
4	24	60	38.25
5	27	60.5	37.75
6	30	61	37.25
7	33.5	61.5	36.75
8	37	62	36.25

9	41	62.5	35.75
PW	45	63	35.5
SW	55	64	35

SHAFT:CLEVELAND HET STEEL SHAFT
GRIP: GOLF PRIDE

VAS 792 Iron Specs

Iron	Loft	Lie	Length
1	16	59	39.75
2	19	59	39.25
3	22	59.5	38.75
4	25	60	38.25
5	28	60.5	37.75
6	32	61	37.25
7	36	61.5	36.75
8	40	62	36.25
9	44	62.5	35.75
PW	48	63	35.5
SW	56	64	35

SHAFT:CLEVELAND HET STEEL SHAFT
GRIP: GOLF PRIDE

GOLF INNOVATIONS

A NEW GOLF CLUB DESIGN PARAMETER

"LEAN"

Manufacturers measure the design characteristics of golf clubs in a way that is different from how golfers use them. In particular, the loft and bounce that a manufacturer assigns to an iron is measured as if golfers position their hands even with the ball. However, at impact (the only place where it counts!) most golfers strive to position their hands ahead of the ball. This position facilitates a solid downward hit but "de-lofts" the club head resulting in a shot that does not have the stated design loft or bounce. The problems associated with de-lofting (less loft and less bounce than intended) are observable with all iron shots but are particularly relevant to wedge shots. These problems can be overcome with the introduction of a new golf club design parameter – in addition to length, lie, and loft, golf clubs need "lean" – an angling of the hosel and shaft towards the target.

Figures 1 and 2 illustrate how the failure to incorporate "lean" impacts a golf shot. Figure 1 shows a golf club in the traditional design position. Here all club head characteristics (in particular loft and bounce) are measured assuming that the projection of the hosel (and, by extension, the shaft) of the club onto the ground is perpendicular to the intended line of flight. A golfer will achieve the design characteristics of the club only if his hands are neither ahead nor behind the ball at impact.

Figure 2 shows the club described in Figure 1 at impact where the golfer's hands are assumed to be ahead of the ball. The hosel and shaft are no longer perpendicular to the line of flight. Note how the effective loft of the club has decreased as has the effective bounce which will lead to the club head "digging" instead of "bouncing."

Figure 3 shows the same club after the introduction of "lean." Here, instead of being perpendicular, the angle of the projection of the hosel (and shaft) onto the ground has been customized so that when the golfer has his hands ahead of the ball he will achieve the design char-

TRADITIONAL

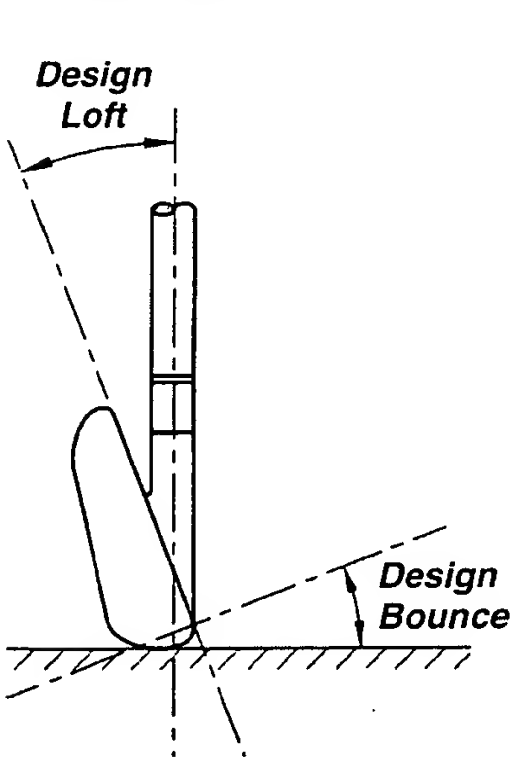

Figure 1

DE-LOFT

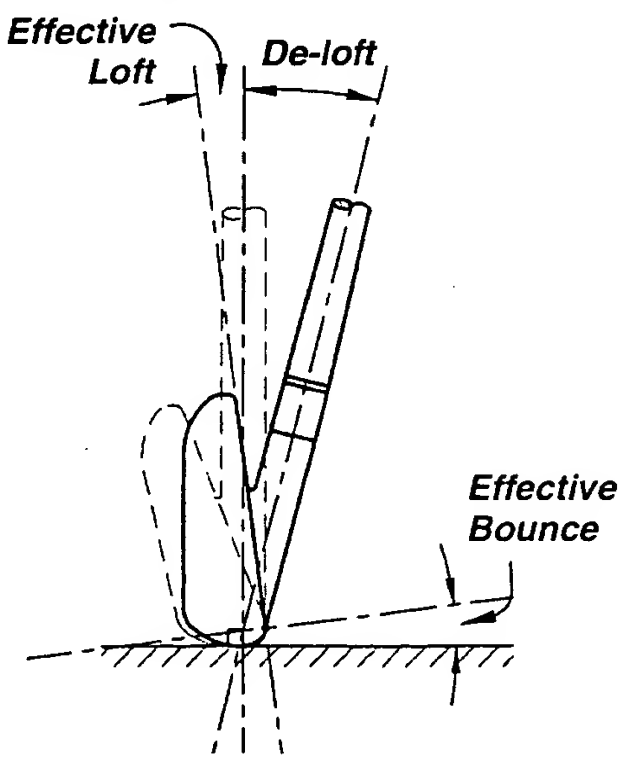

Figure 2

CLUB WITH LEAN

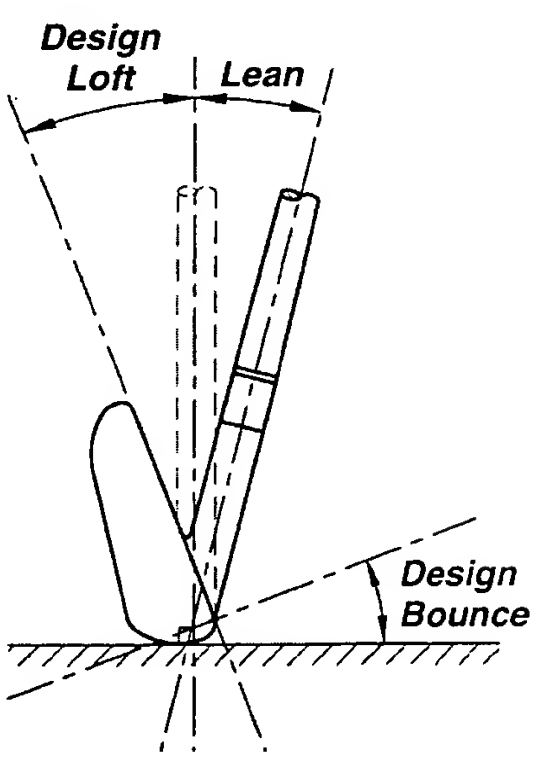

Figure 3

Exhibit C

acteristics of the club. The golfer in Figure 3 has his hands in the same position as the golfer in Figure 2 but is able to achieve the design characteristics described in Figure 1.

"Lean" is necessary because loft and bounce (and other club head characteristics) are inextricably linked. If the only concern were loss of loft due to de-lofting, then the loft could be increased (by choosing a higher lofted club) by an amount that would offset the forward position of golfer's hands. A golf club with such an increase in loft is shown in Figure 4A. However, as shown in Figure 4B, when this higher lofted club is de-lofted, bounce will not be maintained at its desired level. Referring once again to Figure 3, only an adjustment in "lean" allows all club head parameters to maintain their design specifications at impact.

Many golfers struggle to get out of the sand. Golfers are taught that successful sand shots require an open clubface and an open stance. Hitting a sand shot from this position is awkward but allow the golfer to benefit from the bounce of the club head. A sand wedge designed with "lean" will provide the desired bounce when used from a traditional address position. "Lean" will greatly simplifying play out of the sand.

Many golfers also struggle with flop shots. Once again this occurs because of the open clubface and open stance that golfers are called upon to assume when attempting these shots. With "lean" (and perhaps with more loft than is currently available) there will be fewer flubbed flop shots.

Average golfers struggle with the longer irons (1-4) and often replace them with high numbered fairway woods. De-lofting long irons can give the appearance, and can create the reality, of virtually zero or even negative loft. Introducing "lean" to these clubs will make them easier to hit.

EXTRA LOFT

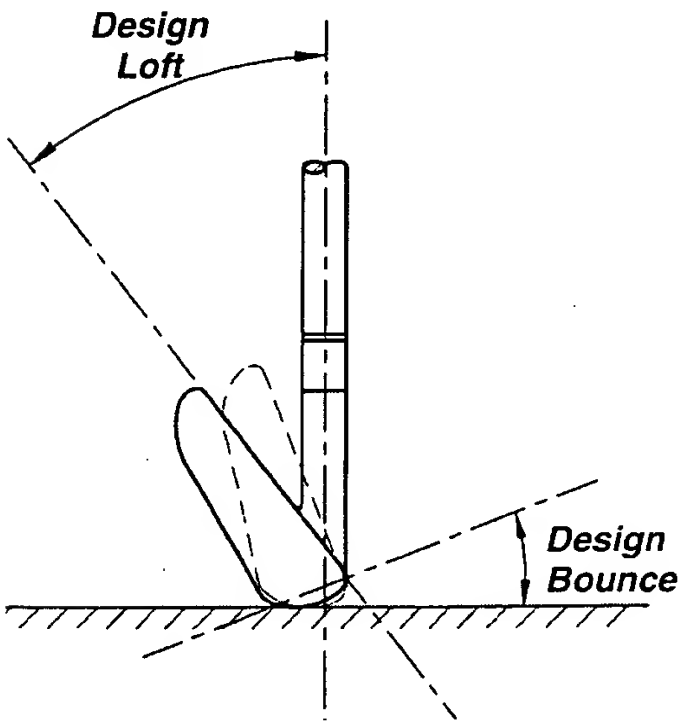

Figure 4A

DE-LOFT CORRECTS LOFT BUT NOT BOUNCE

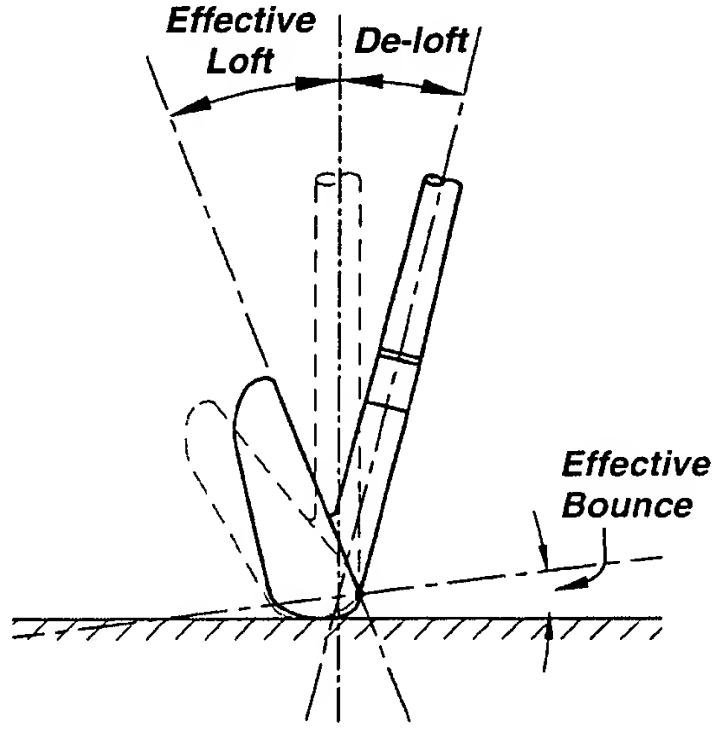

Figure 4B

VIJAY'S SECRET TIP • TOP 75 RESORTS

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Exhibit D

By Frank Thomas

Frank Talk

The aerodynamics of scuffed dimples; should you bend a lob wedge up or down?

Frank Thomas, technical director of the USGA from 1974-2000, is Golf Digest's Chief Technical Advisor. E-mail him at equipment @golfdigest.com.

After I hit a ball with a wedge, it usually leaves a scuff mark on the ball. Does this affect the flight/performance?
Jess Hendriksma, Grand Rapids, Mich.

Surface roughness, like dimples, increases distance by decreasing drag and creating lift. When a ball with backspin passes through the air, the roughened surface creates a layer of disturbed air around the ball similar to an airfoil. A scuff mark alters the symmetrical airflow around the ball. It also alters the optimal design of the dimple pattern. If the surface roughness is not consistent, the ball will have an erratic flight path depending on the severity of the scuffing. The best thing you can do is to take that ball out of play. However, the rules don't permit changing balls during the play of a hole for surface blemishes alone. See Rule 5-3 for further clarification. (For more information about golf ball aerodynamics, visit franklygolf.com.)

Does a three-piece distance ball spin more than a two-piece spin ball? *Derek Stovesand, Charlotte, N.C.*

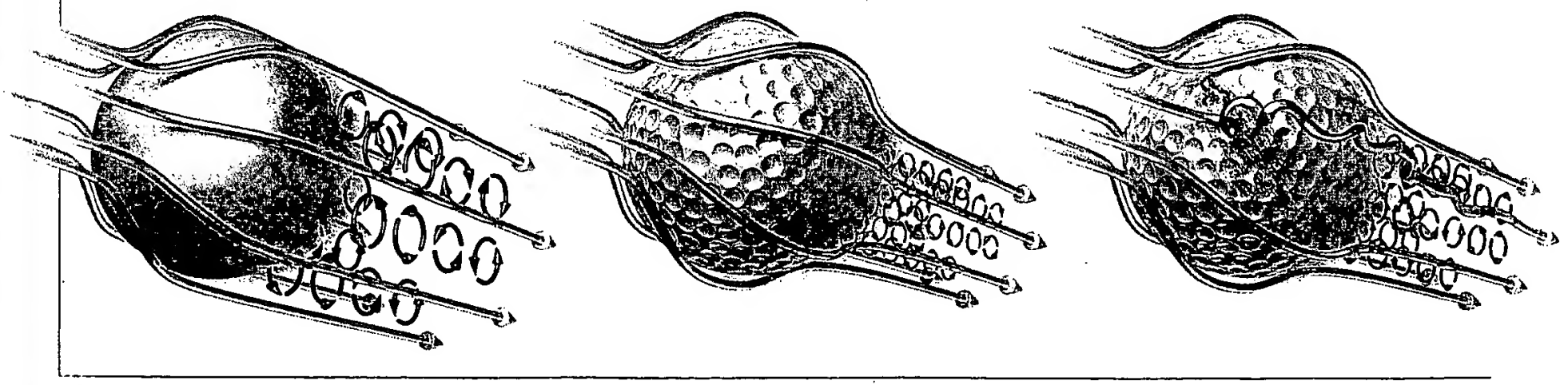
If your swing speed is 85 miles per hour or less, a two-piece soft-core ball with a thin cover will be a good choice. It will have comparable performance properties to the three-piece urethane-covered ball and cost a lot less. But if you can afford the premium ball, it will not hurt your performance and in fact might enhance it, especially if your swing speed is 90-plus mph and if you're looking for better precision around the greens. In Golf Digest testing (September 2003), the largest difference between ball types came in half-wedge shots (as opposed to distance and spin in drivers and irons) where the multilayer (three- and four-piece) urethane-covered ball generated significantly more spin than any other type of ball. The three-piece ball ($35-plus a dozen) is the best all-around performer, but for most golfers it's hard to tell the difference in performance when compared to the large and soft core, thin-covered two-piece balls ($20-$25) on the market today. Conduct an experiment with a multilayer urethane ball and a large-core, thin-covered model from the same manufacturer. Stick with the ball you have most confidence using.

I want to bend a lob wedge to 59 degrees. I'm trying to choose between bending a 58 to a 59 or a 60 to a 59. Would the performance of these two choices be different? *Zach Neufeld, Yucaipa, Calif.*

Yes. The bounce angle changes when you change the loft. Increasing the loft by a degree increases the bounce angle by a degree, and vice versa. This should not be of any major consequence, but you should know about it. Also, make sure the two heads don't have different weights, which will affect the club's swingweight.

I know my irons need their lie angles adjusted because the toe is visibly up at address, and my shots go left. Is it a problem if I have cast heads instead of the more bendable forged heads? *K.V., Milpitas, Calif.*

No, but don't try to do this more than 2 or 3 degrees with a cast club or you'll risk damaging the club. Also, I wouldn't do this repeatedly. If your shots are going left, the lie may be too upright (toe points up at impact); if they're going right, the lie may be too flat (toe down).



A smooth golf ball has a larger drag tail than a dimpled ball, making for a less efficient flight. However, the surface roughness must be symmetrical or the flight will be inconsistent.

CHRIS O'RILEY